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Taxonomic Studies of Himalayan Potentilla (Rosaceae). IV. Polyploidy of *P. peduncularis* D. Don with Description of a Natural Hybrid

Hiroshi IKEDA[a] and Hideaki OHBA[b]

[a]Division of Phylogenetics, Museum of Nature and Human Activities,
6 Yayoigaoka, Sanda, Hyogo, 669-13 JAPAN;
[b]Department of Botany, University Museum, University of Tokyo,
7-3-1 Hongo, Bunkyo-ku, Tokyo, 113 JAPAN

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Chromosome number of *Potentilla peduncularis* collected from eastern Nepal was 2n=42 (hexaploid) and that from central Nepal was 2n=28 (tetraploid). The two cytotypes can be distinguished morphologically by density and length of hairs on leaves, sepals and episepals. The tetraploid was named var. *ganeshii*.

A putative hybrid between *P. microphylla* and *P. peduncularis* var. *ganeshii*, named *P.* × *micropeduncularis*, has characters intermediate between those of the putative parents. The chromosome number of *P.* × *micropeduncularis* was 2n=28, as the same as those of the parents.

This paper aims to provide the chromosome number and morphological variations of *Potentilla peduncularis* D. Don and describe a putative hybrid between *P. peduncularis* and *P. microphylla* D. Don.

Chromosome number was counted in root tips. Locality and voucher specimens are listed in Table 1. Root tips, collected in the field and pretreated in 2 mM 8-hydroxyquinoline solution for 2–3 hours and fixed in Newcomer's fluid, were stained with 2% lacto-propionic orcein and squashed after maceration in 1N HCl at 60°C for 10.5 minutes (Wakabayashi 1988).

Pollen stainability was examined after stained with 1% lacto-phenol cotton blue solution. More than 500 pollens/individual were counted from five individuals of each taxon.

Results and Discussion

The chromosome number of *P. peduncularis* collected from Cha Ding Kharka and Jaljale Himal, east Nepal, was 2n=42 while that from Ganesh Himal, central Nepal was 2n=28. Because the basic chromosome number of *Potentilla* is thought to be X=7, 2n=42 is hexaploid and 2n=28 tetraploid. It is the first report of different chromosome numbers within a single species in Himalayan *Potentilla* section Leptostylae. Though Ikeda (1989) reported the chromosome number of *P. peduncularis* as 2n=28, the plant is not *P. peduncularis* but *P. contiqua* Soják in the present sense.

The tetraploid plants have leaves with sparse, appressed or ascend hairs (1.5–4.0 mm long) on nerves of the lower surface and sparse ascend hairs attaining 1.3–2.2 mm long throughout laminas of the upper surface. The outside of the sepals and episepals are sparsely hairy with ascend or patent hairs (0.8–1.8 mm long). All the plants collected from Ganesh

Table 1. Taxa, localities, voucher specimens and chromosome number of the plants examined. All voucher specimens are deposited in TI

Taxon	Locality	Voucher specimen	Chromosome number
P. peduncularis	E Nepal; Koshi Zone, Sankhuwa Sabha Distr., around Cha Ding Kharka, 4065 m alt.	Minaki et al. 9080169	2n=42
	E Nepal; Koshi Zone, Sankhuwa Sabha Distr., Jaljale Himal, 4100 m alt.	Ohba et al. 9130084	2n=42
	C Nepal; Bagmati Zone, Rasuwa Distr., Ganesh Himal, 4250 m alt.	Miyamoto et al. 9430046	2n=28
P. microphylla	C Nepal; Bagmati Zone, Rasuwa Distr., Ganesh Himal, 4250 m alt.	Miyamoto et al. 9430047	2n=28
P. × *micro-peduncularis*	C Nepal; Bagmati Zone, Rasuwa Distr., Ganesh Himal, 4180 m alt.	Miyamoto et al. 9430061	2n=28

Himal have same hairs on the leaves, sepals and episepals. On the other hand, the hexaploid plants have leaves with dense appressed hairs (0.8–3.0 mm long) throughout laminas of the lower surface and dense erect hairs 0.5–0.8 mm long on the upper surface. The outside of the sepals and episepals are densely hairy with appressed or ascend hairs (0.8–1.8 mm long). These differences are stable and constant. No specimens of *P. peduncularis* are identical with these collected from Ganesh Himal in the hairiness. These two cytotypes, therefore, can be treated as the varieties of *P. peduncularis*. The type of *P. peduncularis*, which was collected in Gosain Than (actually Gosain Kund, central Nepal) by Wallich, apparently agrees with the hexaploid type in the hairy nature. The tetraploid type collected from Ganesh Himal is described as var. *ganeshii*.

A *Potentilla* which shows an intermediate form between *P. microphylla* and *P. peduncularis* var. *ganeshii* was found in Ganesh Himal. The intermediate features were found in the leaf length, the number and width of the leaflets, the base of uppermost leaflet pair, the number and incision of serration, the auricles of stipules, and the shape and length of petals (Table

Table 2. Comparison of *Potentilla* × *micropeduncularis* and the putative parents

	P. microphylla	*P.* × *micropeduncularis*	*P. peduncularis* var. *ganeshii*
Habit	Cushion	Cushion	Rhizomatous
Leaf length (cm)	3.0–4.0	3.5–10.5	4.0–21.5
Number of leaflets	14–19	15–29	23–45
Base of uppermost leaflet pair	cuneate	slightly decurrent	decurrent
*Leaflet width (mm)	1.5–2.5	2.0–5.5	3.0–8.0
*Number of serration	3–5(–7)	5–7	7–11
Incision of serration	deep	middle	shallow-middle
Auricles of stipules	free	variable	connate from base to top
Petal shape	elliptic	elliptic-obovate	obovate
Petal length (mm)	6.0–8.0	7.0–11.0	8.0–15.0
Pollen stainability (%)	80.2 (75.0–87.5)	2.1 (1.0–3.5)	95.6 (94.3–96.7)
Chromosome number	2n=28	2n=28	2n=28

*terminal leaflet.

2). This plant with intermediate features is considered as a putative hybrid between the two species, and named *P.* × *micropedunculari*s. The hybrid seems to be reproduced vegetatively by means of separation of stems. The auricles of radical leaf stipules of *P. microphylla* are free while those of *P. peduncularis* are connate from base to top. Degree of connation in *P.* × *micropedunculari*s is variable. The chromosome number of *P.* × *micropedunculari*s was 2n=28, as the same as those of *P. microphylla* (Ikeda 1989) and *P. peduncularis* var. *ganeshii*. In *P. microphylla* we have also confirmed 2n=28 in Ganesh Himal. Pollen stainability of *P.* × *micropedunculari*s is very low (2.1%) against those of *P. microphylla* and *P. peduncularis* (more than 80%) (Table 2).

Taxonomic treatment

Potentilla peduncularis D. Don, Prodr. Fl. Nepal.

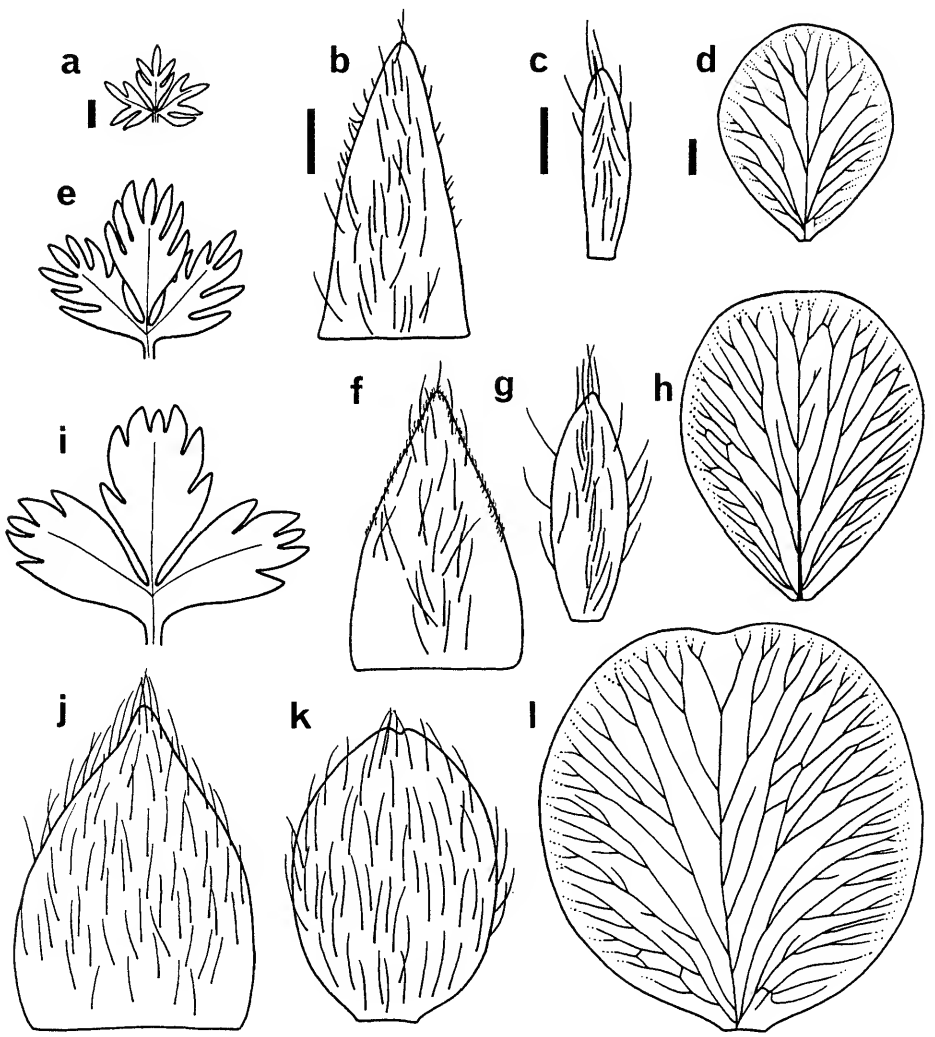

Fig. 1. Comparison of *Potentilla microphylla* (a–d; Suzuki et al. 8880718, TI), *P.* × *micropedunculari*s (e–h; Miyamoto et al. 9430046, TI), and *P. peduncularis* var. *ganeshii* (i–l; Miyamoto et al. 9430070, TI). a, e, i: Upper part of leaves. b, f, j: Outside of sepals. c, g, k: Outside of episepals. d, h, l: Petals. Bars indicate 1 mm.

230 (1825).

Further synonyms will be published in Ikeda and Ohba (in press).

Type: Nepal; Gosain Than (Wallich s.n., BM-holo).

var. **ganeshii** H. Ikeda & H. Ohba, var. nov. (Fig. 1)

A typo foliis pilis infera nervis sparsis (non densis) supra adcendentibus 1.3–2.2 mm longis (nec erectis nec 0.5–0.8 mm longis) ornatis et sepalis episepalisque extera sparse (nec dense) pilosis differt. Chromosomatum numerus diploideus 28 (nec 42).

Type: C Nepal; Bagmati Zone, Rasuwa Distr., Tulo Bhera Kharka – Jaisuli Kund, 4250 m alt. (Miyamoto et al. 9430046, 30 July 1994, TI-holo, KATH, BM, GH-iso).

Examined specimens: C Nepal; Bagmati Zone, Rasuwa Distr., around Tinbu Kharka, 3860 m alt. (Miyamoto et al. 9430037, 27 July 1994, TI). C Nepal; Bagmati Zone, Rasuwa Distr., Yure Kharka – Tinbu Kharka, 3485 m alt. (Miyamoto et al. 9430021, 26 July 1994, TI). C Nepal; Bagmati Zone, Rasuwa Distr., around Seto Kund, 3860 m alt. (Miyamoto et al. 9430106, 9 Aug. 1994, TI).

From the field observations, var. *peduncularis* grows on moist places such as around glacier lake, along a stream or lower part of slopes in east Nepal. On the other hand, var. *ganeshii* grows various habitat from moist to fairly dry place such as ridge of hills or upper part of slopes. Variety *ganeshii* which grows on dry place has smaller leaves with smaller number of serration than those of var. *peduncularis*, but those characters are not clear in those in moist place.

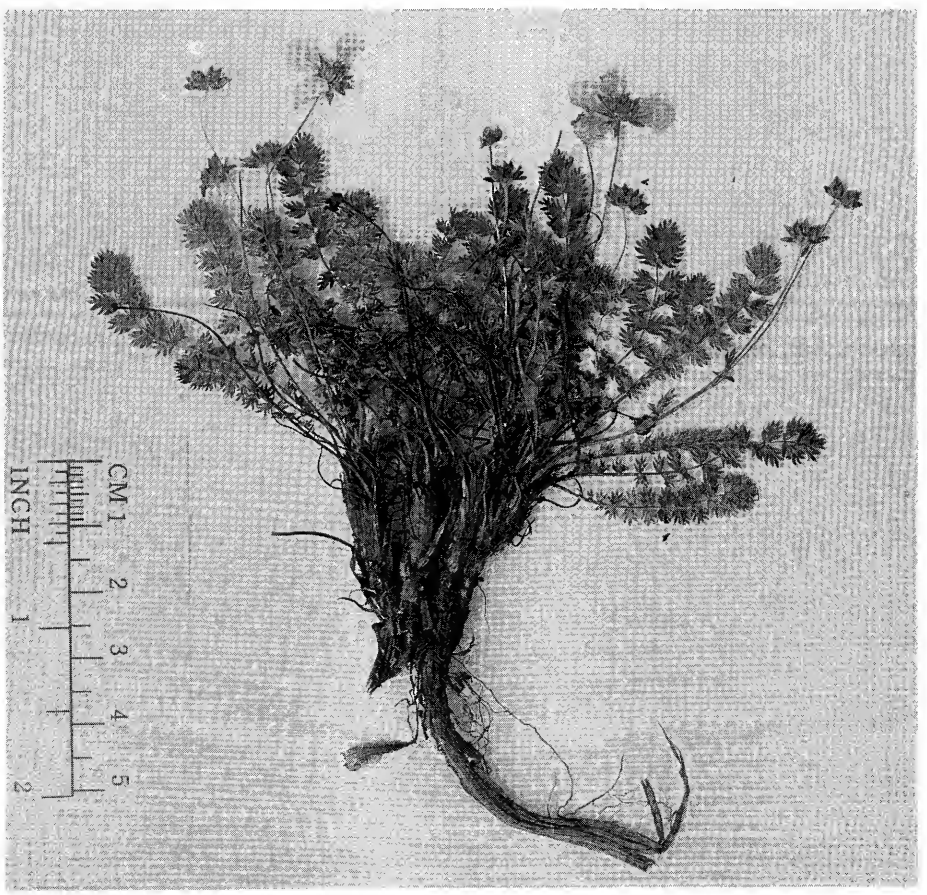

Fig. 2. *Potentilla* × *micropeduncularis* (Miyamoto et al. 9430070, TI-holotype).

Potentilla×micropedunculariss H. Ikeda & H. Ohba, hybrid nov. (Figs. 1, 2).

Potentilla microphylla D. Don × *P. peduncularis* D. Don var. *ganeshii* H. Ikeda & H. Ohba.

Planta inter *P. microphylla* D. Don et *P. peduncularis* D. Don quasi intermedis et verisimiliter ex hybridatione harum specierum orta, ab illa foliolis pinnatifidis nec pinnatisectis et summorum binatorum basi parum decurrenti (nec cuneata) ab hoc rhizomate brevi repente caule basi multo ramosiore bene diagnoscenda.

Stems much branched near the ground. Radical leaves 3.5–10.5 cm long, 6–15 mm wide, 7–14 pairs of lateral leaflets. Base of uppermost leaflet pair slightly decurrent. Leaflets pinnatifid; terminal leaflet 4.0–7.0 mm long, 2.0–5.5 mm wide, serrate with 5–7 teeth. Auricles of stipules free of connate. Inflorescence 1–2(–3) flowers. Petals elliptic to obovate, 7.0–11.0 mm long, 4.5–9.0 mm wide. Pollen stainability 2.1% (1.0–3.5%). Chromosome number 2n=28.

Type: C Nepal; Bagmati Zone, Rasuwa Distr., Jaisuli Kund – Paldol Base Camp, 4240 m alt. (Miyamoto et al. 9430070, 2 Aug. 1994, TI-holo, KATH-iso).

Examined specimens: C Nepal; Bagmati Zone, Rasuwa Distr., around Jaisuli Kund, 4180 m alt. (Miyamoto et al. 9430061, 1 Aug. 1994, TI). C Nepal; Bagmati Zone, Rasuwa Distr., Paldol Base Camp – a Kharka, 4050 m alt. (Miyamoto et al. 9430079, 3 Aug. 1994, TI).

This was found beside streams or rocky slopes where the putative parents were also found. It reproduces vegetatively through multiple branching of rhizomes near the ground.

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References

Ikeda H. 1989. Chromosome numbers of Himalayan *Potentilla* (Rosaceae). J. Jpn. Bot. **64**: 361–367.

Wakabayashi M. 1988. Present situation of cytotaxonomy of Himalayan plants. Newslett. Himalayan Bot. No. 3, 8–11.

池田　博[a]，大場秀章[b]: **ヒマラヤ産キジムシロ属（バラ科）の分類学的研究　IV. *Potentilla peduncularis* D. Don の種内倍数性と雑種**

Potentilla peduncularis D. Don はネパール，シッキム，東チベットに分布する．東部ネパールで採集した個体は 2n ＝42の 6 倍体であったのに対し，中部ネパールのガネッシュヒマールで採集した個体は 2n ＝28の 4 倍体であることが明らかになった．4 倍体と 6 倍体は葉，萼，副萼にはえる毛の密度と長さが異なることが判った．*Potentilla peduncularis* のタイプは，中部ネパールの Gosain Kund で採集され，毛の形質から 6 倍体と推定される．ガネッシュヒマール地域に分布する個体は，毛の形質が他の地域の個体と異なることから，変種 var. *ganeshii* として区別した．

Potentilla peduncularis var. *ganeshii* と *P. microphylla* D. Don が同所的に生育する場所では両種の中間的な形態を持つ個体が見いだされた．これは花粉の染色性が低いことから雑種と推定され，茎を地面近くで多数分枝させ，栄養繁殖を行なっていると考えられるので，*Potentilla* × *micropeduncularis* と命名した．その染色体数は推定両親種と同じ 2n ＝28であった．

（[a]兵庫県立人と自然の博物館系統分類研究部，
[b]東京大学総合研究博物館生物系研究室）